

Canada
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Canada Geological Survey

GEOLOGICAL SURVEY OF CANADA
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MINERAL RESOURCES OF CANADA

[No. 6]

[Bulletin on]

ZINC

*Reprint of Article in Annual Report of Section of Mines for 1902,
Part S, Vol. XV.*

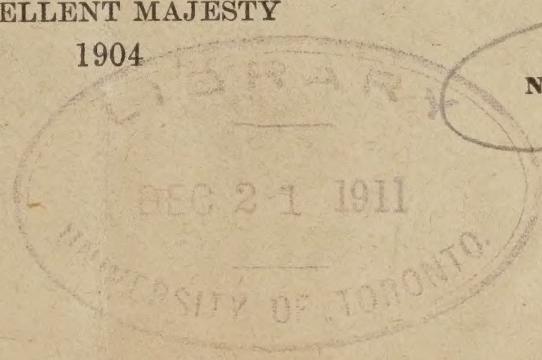


OTTAWA

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ZINC

ZINC.

The only production of zinc in 1902 of which we have any record Production was from one mine in Olden township, Ontario. About 950 tons of ore were raised valued at \$11,500 or a little over \$12 per ton. About 158 tons of ore, averaging about 45 per cent zinc, were shipped to Swansea, Wales, the balance being left at the mine to be shipped during the following season. The metallic zinc contained in the ore shipped amounted to about 142,200 pounds which at the final average New York market price of the metal would be worth \$6,882.

TABLE 1.

ZINC.

ANNUAL PRODUCTION OF ZINC.

Calendar Year.	Pounds.	Value.
1898.....	788,000	\$ 36,011
1899.....	814,000	46,805
1900.....	212,000	9,342
1901.....
1902.....	142,200	6,882

TABLE 2.

ZINC.

IMPORTS OF ZINC IN BLOCKS, PIGS AND SHEETS.

Imports.

Fiscal Year.	Cwt.	Value.	Fiscal Year.	Cwt.	Value.
1880.....	13,805	\$67,881	1892.....	21,881	\$127,302
1881.....	20,920	94,015	1893.....	26,446	124,360
1882.....	15,021	76,631	1894.....	20,774	90,680
1883.....	22,765	94,799	1895.....	15,061	63,373
1884.....	18,945	77,373	1896.....	20,223	80,784
1885.....	20,954	70,598	1897.....	11,946	57,754
1886.....	23,146	85,599	1898.....	35,148	112,785
1887.....	26,142	98,557	1899.....	18,785	107,477
1888.....	16,407	65,827	1900.....	28,748	156,167
1889.....	19,782	83,935	1901.....	20,527	103,457
1890.....	18,236	92,530	1902Duty free	34,871	141,560
1891.....	17,984	105,023			

ZINC.
Imports.

TABLE 3.
ZINC.
IMPORTS OF SPELTER.

Fiscal Year.	Cwt.	Value.	Fiscal Year.	Cwt.	Value.
1880.....	1,073	\$ 5,310	1892.....	13,909	62,550
1881.....	2,904	12,276	1893.....	10,721	49,822
1882.....	1,654	7,779	1894.....	8,423	35,615
1883.....	1,274	5,196	1895.....	9,249	30,245
1884.....	2,239	10,417	1896.....	10,897	40,548
1885.....	3,325	10,875	1897.....	8,342	32,826
1886.....	5,432	18,238	1898.....	2,794	13,561
1887.....	6,908	25,007	1899.....	5,450	29,687
1888.....	7,772	29,762	1900.....	5,836	29,416
1889.....	8,750	37,403	1901.....	14,621	58,283
1890.....	14,570	71,122	1902* Duty free	18,356	80,757
1891.....	6,249	31,459			

*Spelter in blocks and pigs.

TABLE 4.
ZINC.
IMPORTS OF ZINC, MANUFACTURES OF.

Fiscal Year.	Value.	Fiscal Year.	Value.
1880.....	\$ 8,327	1891.....	\$7,178
1881.....	20,178	1892.....	7,563
1882.....	15,526	1893.....	7,464
1883.....	22,599	1894.....	6,193
1884.....	11,952	1895.....	5,581
1885.....	9,459	1896.....	6,290
1886.....	7,345	1897.....	5,145
1887.....	6,561	1898.....	10,503
1888.....	7,402	1899.....	14,661
1889.....	7,233	1900.....	11,475
1890.....	6,472	1901.....	6,882
1902 { Zinc seamless drawn tubing.....		Duty.	
" manufactures of, N.O.P.....		Free.	\$ 47
		25 %	6,636
Total.....			6,683

The production and sale of zinc-ores may now be regarded as a definite and interesting feature of the mineral industry of the Dominion as shown by the following extract from the Report of the Minister of Mines of British Columbia for 1902 :—

'Formerly, zinc in the silver-lead ores in the Slocan was a detriment, the smelters having exacted a penalty for its presence. The ore is now

being sought after by the American zinc smelters, and prices are being paid for it which will enable the shippers to realize a profit on a commodity they had looked upon as being not only worthless but injurious. A number of mines, notably among them the Payne, Ivanhoe, Slocan Star and some others have availed themselves of this new market by shipping a considerable quantity of the ore to Iola, Kansas, where it is being treated. Preparations are also being made to re-model some of the mills, for the better separation of the ores, and it is reported that a number of other mills will be built, during the coming summer, for the proper and more economical handling of the product.¹

ZINC-ORE DEPOSITS.

Ores.

The zinc ores of Canada have so far received but slight attention and the work of exploiting them has been spasmodic. In fact it has only been during the last few years that any attention has been paid to the matter, the present awakening of interest being due to the considerable demand for zinc ores which has lately arisen.

So far as discovery has yet gone, in eastern Canada deposits of workable zinc ores are few. Zinc blende occurs, however, at many points accompanying galena, and in British Columbia a commencement has been made in shipping it to smelters both in the United States and in Belgium. Blende as an associated mineral is of frequent occurrence in Canada in veins worked for gold, silver and copper.

The possibilities for profitable working of some of our zinc ores have been largely increased, owing to the growth in the demand due doubtless to the general commercial activity characterizing the last few years. Ores of this metal, other than blende, have not as yet been proved to exist in Canada in economic quantities.

Taking the separate parts of the Dominion, little is on record as to economic deposits of these ores in Nova Scotia, but blende in small quantities occurs in many of the gold-bearing quartz veins in that province.

In this connection the following information is furnished by Mr. F. H. Mason, F.G.S. Analyst etc., of Halifax Nova Scotia.

"The only deposit of zinc blende that has any economic possibilities that I know of in Nova Scotia, is that owned by the Cheticamp Gold Mining Company situated at Faribault brook, a branch of the Cheticamp river, Inverness Co. C.B. It occurs in a bed of sericite schist some 20 feet in thickness and is associated with pyrrhotite, mispickel and

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Ores.

galena. The mineral occurs in bands through the schist and is in places quite massive. I have seen lenses over 2 feet in thickness. A slope 45 feet deep has been sunk upon it. I have found that by crushing to about $\frac{1}{4}$ mesh and roasting prior to concentration a fairly clean galena and blende concentrate may be obtained."

In New Brunswick and Quebec, sphalerite also occurs as an associate mineral in veins carrying galena, but as extensive mining operations have never been carried on continuously, none is produced even as a by-product. In the latter province the only point at which zinc was claimed to occur in anything like commercial quantities is on the property of the Grand Calumet Mining company. This is situated on lot 10 range IV. Calumet island, Pontiac county, Que., at a point on the Ottawa river about 50 miles above Ottawa city. It exists at this place in deposits in the Laurentian rocks of the district. They were described in 1898 by Dr. R. W. Ells of the Geological Survey staff as follows :—

"The most important mining developments along the lower Ottawa at present are on Calumet island. Here the old workings on the Lawn property, near the east end of the island, on blende and galena deposits, have been extended and development work is now carried on over three lots on Range IV. The containing rocks are largely dioritic with some reddish granite, and these masses are intrusive through the grey gneiss and limestones. These latter are well exposed along the Roche Fendue channel of the Ottawa on the south side of this island. The principal workings at present are on what is known as the Bowie property, where a large open cut has been made on an ore-body in the diorite consisting of both blende and galena. The ore-body is of considerable extent, but is pockety in its character, and no well defined hanging or foot walls were seen, though the mass sends off spurs into the enclosing diorite. Over 1,000 tons of ore were mined at this place during the past summer, and it finds a ready sale in the European market. On the west part of the area, a shaft has been sunk to a depth of nearly 130 feet, in order to cross-cut and intersect several masses of ore that appear at the surface in this vicinity; but work on this location was suspended during the season, in order to fill orders from the Bowie pit. There is evidently a large quantity of mixed blende and galena ores in the intrusive rocks of this district, but in none of the openings examined was any well defined vein structure noted, the ore every where appearing rather in pockety masses, though some of these are of large extent."

In Ontario also numerous deposits of galena accompanied by more ZINC.
or less zinc blende are known to exist. These, although wrought from ORES.
time to time in past years, have not so far been placed upon a permanent working basis, so that although blende might otherwise be produced as a by-product it cannot as yet be counted upon as worth working alone. A few examples of these which have received attention of late years, may be here mentioned.

The Katherine lead and zinc mine is situated upon lot 7 Con. XI. Lake township, Hastings county, 3 miles from Millbridge. Some development work was done at this place during 1900, by the British and Colonial Mining and Development company of Ontario. As described in the Report of the Ontario Bureau of Mines for 1900, the vein is said to carry galena and zinc blende in calcite, the average of the ore shewing 10 ounces of silver to the ton. It is also stated that the vein is in diorite and has a width varying from one to four feet. Up to 1900 two shafts had been sunk, one to a depth of 125 feet, and another at about half a mile from this, to a depth of 18 feet. Diamond drilling had been carried to a depth of 292 feet.

A deposit of zinc blende with galena was discovered three or four years ago in the upper Laurentian series, on lot 3, con. V., of the township of Olden, or thirty-five miles northward of Kingston. Professor W. G. Miller, provincial geologist of Ontario, has kindly furnished the following description of the occurrence and its workings:—

"The ore-body lies in crystalline limestone of the Grenville series, and indications of the ore show on the surface for a distance of about half a mile in the direction of the strike of the rock, north-east and south-west. The deposit is rather irregular in character. In some parts of its course it is distinctly vein-like, in others the ore is found occupying pockets of considerable size. In some of these pockets 100 or 200 tons of ore have been found. The ore is a rather intimate mixture of zinc blende and galena, resembling in this respect the Broken Hill ore of New South Wales. The blende at times, however, occurs in a coarsely crystalline form and practically free from lead. The pure galena has been found to carry 20 ounces or more of silver to the ton of 2,000 pounds. A small percentage of iron pyrites is associated with the blende and galena.

"The property is owned and operated by Messrs. James Richardson & Sons, of Kingston. Work has now been in progress for over two years, but only a small force of men has been employed. The main opening has reached a depth of 80 feet and considerable stoping has been done. The plant consists of boiler, steam hoist, steam drill, etc.

The ore is shipped to England. In winter it is drawn by sleighs six miles, either to Parham station, on the Kingston and Pembroke Railway, or to Mountain Grove station, on the Canadian Pacific, which lies 175 miles west of Montreal. From Parham, the ore is carried 39 miles by rail to the city of Kingston, where it is loaded on grain barges and taken down the St. Lawrence during the season of navigation and landed directly on the Atlantic steamers. During the present winter ore is being hauled to Mountain Grove, and is to be shipped by Canadian Pacific Railway and steamship line to Great Britain.

"No concentrating plant is used. The ore is hand-picked for shipping and runs 40 to 45 per cent in metallic zinc and 12 to 15 per cent in metallic lead. The iron pyrites present amounts to about 4 per cent. Over 1,500 tons of such ore have been mined. No allowance is made for the lead unless it exceeds 10 per cent, and the buyers pay nothing for the silver contained in the ore. The gangue associated with the ore consists essentially of calcite or dolomite and pyroxene. There are a few other minerals present, such as frequently occur in crystalline limestone, such as vesuvianite. The material, which does not run up to 40 per cent in zinc, is left lying on the dump. A concentrating plant will probably be erected if it is found that the amount of ore in the deposit warrants it, as a higher price would be obtained for the metallic contents, and freight would not have to be paid on the rock-matter."

At Blende lake, about two miles north of the eastern end of Thunder bay, Lake Superior, blende in large crystals occurs in a vein of coarse calcite about eight feet in width. The south wall of the vein, which runs east and west, consists of dioritic schist of Huronian age, while the north wall is formed by ferruginous and silicious clay slates of the Animikie Series.

In the Thunder bay district the silver veins which were extensively worked some years ago, carried considerable blende in places. At some of the mines this mineral, when enriched by the secondary minerals, argentite and native silver, constituted the main constituent of these ore bodies, although at most of them it would simply be an accessory constituent of the vein. The Silver Mountain vein is the only one which has been worked of late, most of the other mines having been idle for a number of years.

The only zinc deposits proper which have so far been developed to any extent in Canada are located in Ontario near Rossport station on the Canadian Pacific Railway, on the north shore of Lake Superior. The Zenith mine is situate some 12 miles north of the lake shore, at

the head waters of the White Sand river. Access is had to it in ZINC summer by canoeing up the river and the chain of small lakes along its ORES course. In winter, better communication is to be had over the ice by means of a road connecting these sheets of water.

The deposits seem to consist of more or less irregular bodies of sphalerite in the hornblendic and dioritic Huronian rocks of the vicinity. When visited by Mr. E. D. Ingall for the Geological Survey in 1884, the work done had not been of sufficient extent to allow of positive conclusions being arrived at as to their real nature. A number of surfaces of ore had been exposed at different points on the property in following up the surface indications by the removal of the capping of earth or solid rock under which they had been found to pass.

The ore exposures consisted of one on the top of a hill on the one side and the other near the base on the other side, near the shore of a little lake. The hill is about 75 feet in height above the lake level. At neither point had the limit of the ore been shown in any direction, and therefore such features as the strike, dip and thickness could not definitely be determined. At the lower workings a surface of solid ore had been exposed, measuring about 20 feet x 15 feet, a smaller exposure about 90 feet to the south east of this measuring 10 feet x 10 feet. Easterly from the main stripping about 30 feet, outcroppings seem to show the existence of a small vein about six inches thick striking about N.E. dipping 45° N.W. and a small parallel vein shows about 15 feet further west again. The upper workings are some 500 feet north of these. At the time of the visit above mentioned (1884) a surface of solid blende about 15 feet x 20 feet had been exposed by stripping. The formation strikes about W.N.W. and dips northerly about 50°. In an easterly direction from the exposure the ore if continuous must underlie a capping of country rock. Although no final opinion could be formed at that time and under the conditions then existent, the impression was formed, from the features presented on the ground and from the minute structure of some of the ore, that it probably exists as masses coinciding with the foliation of the country rock, and would thus follow it in all its flexures. If this be the case, one would expect in the sharper bends to find large irregular masses of ore connecting with thinner sheets in the less folded portions. This supposition would explain the peculiar features of the ore surfaces above mentioned, especially the upper one, where it would appear as if the prospectors had uncovered one of these bends from above by stripping off the overlying rock representing the upper portion of a fold.

ZINC.
Ores.

Indications of other occurrences in the vicinity of those already alluded to, were also noted. The foliated structure of the rock was not always plainly apparent, being confused by the jointing.

The blende is dark coloured and the associated minerals noticed were copper and iron pyrites and here and there a little dendritic native copper also a white incrustation on the weathered surfaces, probably sulphate of zinc from oxidation of the ore.

Although the existence of ore at this place was known more than 20 years ago, owing to its inaccessibility it was not worked until the winter of 1898-99. Operations were then continued on and off for a year or two, but the mine is now idle. The total amount of ore shipped as per returns received at this office, was 1065 short tons. The latest description of the progress made at the mine is given in the report of the Ontario Government Inspector of mines as follows:—To Feb. 21, 1900, three shafts had been sunk; No. 1, 35 feet deep; No. 2, 40 feet deep; No. 3, 12 feet deep. A small open cut had also been made, from which about 100 tons of ore had been taken. All the shipments were made in the winter by hauling the ore over the ice on the lakes and on the connecting stretches of road which had been cut out for the purpose. Freighting from the mine to the railroad is said to have cost about \$2.00 per ton.

Speaking of his visit to this place on Feb. 14, 1901, the mining inspector describes the condition of things as follows;—

"Mining operations since a year ago have been confined to driving a tunnel into the hill in which the zinc blende deposits occur, starting on the level of the small lake at the foot at a point between the old shafts, about 100 feet north of No. 1 and 500 feet south of No. 2 and beneath the old open stope in the brow of the bluff. The length to date is 75 feet, including 18 feet of open cut at the mouth, and in its course of about northeast, the tunnel is intended to crosscut to the main veins found on the surface as well as to explore the country rock.

"In the open cut, a large body of zinc blende was struck and stoped up 15 feet to the surface, in places 4 and 5 feet wide, but of very irregular shape, and without any visible continuous walls. At 12 feet in the tunnel another band of solid blende a foot wide runs down into the floor, and at 30 feet beyond this is a third body, 15 inches wide at first but pinching out in ten feet at the face. Besides these three main strikes, many other intermediate stringers and veins from a fraction to 10 inches wide were passed, all having approximately the same strike of north and south and dip of about 25 degrees east, into the hill, which bearings coincide with those of the outcropping

of the large vein at the surface above. The country rock as seen ZINC. in the tunnel has been disturbed and broken up along two directions, giving it a "blocky" appearance, the main movement having been sufficient to produce schistose areas in widths from streaks up to several feet, striking north and south with dip 25 degrees east, which directions are the same as those of the ore-bodies. In fact it is in this schist, altered in places from the coarse green trap rock to a soft gouge that most of the veins have been found.

"Grains of zinc blende occur imbedded in the massive trap, having no connection with the main deposits; frequently also masses of the sulphides, pyrites, pyrrhotite and chalcopyrite, are exposed in the seams, both separate from and contiguous to the blende. The massive zinc blende in the tunnel workings contains small grains of pyrites and pyrrhotite disseminated uniformly throughout it, forming but a small percentage of the whole, yet in considerably greater quantity than is found in the very coarse blende at the old surface stope."

A specimen of the ore from this place supplied to the chemical branch of the survey by Dr. R. Bell gave 54.26 per cent of metallic zinc. The average of the ore shipped however is said to have run about 45 per cent.

Speaking of the work done in 1901, the Ontario Government Mines Inspector gives the following particulars: "The owners, the Grand Calumet Mining company of Ottawa, Ont., have not undertaken any systematic plan of development, the stoping out of the above ore from the biggest showings in the various old workings leaving the property in practically the same state as before. No. 1 shaft at its depth of 30 feet was enlarged to 20 by 20 feet, in the west side a 10-foot winze sunk, in size 6 by 12 feet, and at the surface some underhand stoping done, producing in all 80 tons of ore. Small stringers and pockets of zinc blende show on all the shaft faces and on the west side the continuation of the ore-body in the winze extends up to the surface, one or two feet wide, in irregular outline, but probably large enough to pay to follow. The tunnel was driven a few feet further, total length now 80 feet, and discontinued as no more ore was struck, but from the whole working, including the open cut at its mouth, 40 tons were extracted. Between No. 1 shaft and the tunnel, an outcropping of blende gave 20 tons from an underhand open stope. From the two old open-cuts on the brow of the hill 160 tons further were mined by stoping 6 feet deeper, still leaving a fair showing of ore in the bottom. No. 2 shaft at the west side of the hill is now down 50 feet, an increase of 15 feet, the last eight forming a sump below the level floor, into which

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Ores.

the bucket drops for loading. The first level was abandoned and closed up, no ore being found therein. In the second level at 42 feet depth, the east drift, 42 feet in length, was originally run at 38 feet depth, followed by the removal of a 4-feet underhand level, now 25 feet in, and along which a lense of ore lies from 2 to 8 feet wide, its upper edge pinching out in the roof. The first level, 6 feet above shows no ore at all, but in the floor, ore fills the drift from wall to wall and strikes about northeast-southwest with dip of 60° north. Considerable ore has also been mined from around the mouth of the shaft, which with that from underground totals some 500 tons."

The foregoing detailed descriptions have been reproduced in full on account of their giving a very good idea of the irregular mode of occurrence of the ore-bodies, thus corroborating the idea arrived at by the writer from the examination made in 1884 and because a right understanding of the conditions at this place, where the ore-bodies have been worked out, will be very helpful in future in judging the possibilities of other similar deposits found in the district.

Indications of the existence of a number of other bodies of zinc ore are reported from the district around the Zenith mine, and a number of mineral locations have been taken up. On one of these viz. E.S. 79, some development work has been done. This is known as the Gesic mine. The shaft, at the time of the visit of the Ontario Inspector of Mines in February 1900, had been sunk some 23 feet on a shear zone in the "country rock," showing a little mineralization; but he reports the bottom as showing ore in promising quantities.

At Mazokama River, about 25 miles further west, on the main line of the Canadian Pacific Railway, it is reported that zinc blende has been found.

In a strong vein known as Johnston's mine, which also holds galena at Wolf river, north-west of the head of Black bay, Lake Superior, bunches of blende are scattered through the gangue, which consists of calc spar and quartz.

At the Victoria and the Cascade Mines, Garden river, near Sault Ste. Marie, which were worked in past years primarily for galena, a considerable proportion of blende occurs along with it.

Isolated crystals of blende, generally of a light colour, occur in the dolomite of the Guelph formation from the falls of Niagara to the township of Beverley at the head of Lake Ontario.

So far as our present knowledge extends, British Columbia will prove to be the chief source of zinc ores in Canada. In the silver-lead

mining districts of East and West Kootenay, zinc blende in varying proportions occurs as an associate mineral with the galena, and in mining, the blende is produced as a by-product. Whilst in some of the mines and districts, blende forms quite a sub-ordinate feature of the veins, in others it exists in quite large proportion.

During 1902 considerable interest was aroused in the province in regard to this mineral owing to the visits of agents of smelter firms in the United States seeking zinc ores. Some difficulty was anticipated in profitably marketing the product on account of high freight and the duty on the ore entering the United States. It is now reported however that favourable arrangements have been arrived at regarding both these points and that shipments of the mineral to the American smelters from the Slocan mines have commenced.

Blende is associated with the galena found in the Devonian limestone of Great Slave lake, N.W.T.*

